

Fisher® 1061 Pneumatic Piston Rotary Actuator with Style H & J Mounting Adaptations

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Figure 1. Fisher 1061 Actuator



Introduction

Scope of Manual

This instruction manual includes installation, adjustment, maintenance, and parts ordering information for the Fisher 1061 pneumatic piston rotary actuator (sizes 30, 40, 60, and 68) with H and J mounting adaptations (see figure 1). Instructions for the positioner, accessories, and, if used, the auxiliary handwheel actuator are covered in separate instruction manuals.

Do not install, operate, or maintain a 1061 actuator without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. **To avoid personal injury or property damage, it is important to carefully read, understand, and follow all the contents of this manual, including all safety cautions and warnings.** If you have any questions about these instructions, contact your Emerson Process Management sales office before proceeding.



Table 1. Specifications

Available Configuration Double-acting pneumatic piston rotary actuator for ■ throttling service when used with positioner or ■ on-off service when used with switching devices. Mounting adaptations include ■ H mounting for rotary actuation of equipment other than Fisher valves or ■ J mounting for rotary actuation of Fisher keyed-shaft butterfly valves and other keyed-shaft equipment	Maximum Valve Shaft Rotation ■ 90 degrees or ■ 60 degrees (travel stop required for 60 degrees rotation)
Actuator Sizes ■ 30, ■ 40, ■ 60, and ■ 68	Stroking Time Dependent on actuator size, degrees of rotation, and positioner if used. If stroking time is critical, contact your Emerson Process Management sales office
Cylinder Operating Pressure Minimum Recommended: ■ 1.4 bar (20 psig) without positioner or ■ 0.3 bar (5 psig) above actuator requirement with positioner ⁽¹⁾	Material Temperature Capabilities With Standard Elastomers -34 to 82°C (-30 to 180°F)
Maximum Allowable: Sizes 30 and 40: 10.3 bar (150 psig) Size 60: 6.9 bar (100 psig) Size 68: 5.9 bar (85 psig)	Pressure Connections 1/4 NPT internal
Torque Limits Limited by maximum cylinder operating pressure or by tables 2 and 3, whichever is less	Travel Indication Graduated scale and pointer located on actuator cover at actuator end of valve shaft
	Mounting Positions See figure 4
	Approximate Weights See table 4

1. See separate manual for positioner specifications.

Description

The 1061 actuator is a pneumatic piston rotary actuator for use with rotary control valves and other equipment. The H mounting adaptation permits the actuator to be used with user-provided mounting brackets and couplings for rotary actuation of equipment other than Fisher valves. The J mounting adaptation permits the actuator to be used for rotary actuation of Fisher keyed-shaft butterfly valves and other keyed-shaft equipment that can mount on the actuator yoke.

The H mounting adaptation includes a flat-surface mounting plate that is drilled and tapped for attaching the user-provided bracket. Cap screws for attaching the bracket are provided. H mounting also includes an output shaft (with milled flats) to provide the rotary output either directly or through a user-provided coupling⁽¹⁾. Output shaft diameters and torque limits are listed in table 2. Dimensional information for the mounting plate and output shaft are shown in figure 2.

The J mounting adaptation uses the standard butterfly valve mounting bracket and provides an output shaft with an attached coupling for keyed equipment shafts. Coupling sizes and torque limits are listed in table 3. Dimensional information for the mounting yoke and output shaft coupling is shown in figure 2.

Additionally, the 1061 actuator can be used for either throttling or on-off applications. For auxiliary manual operation of the equipment, a side-mounted handwheel actuator is available.

Specifications

Specifications are shown in table 1 for 1061 actuators. Specifications for a given 1061 actuator as it originally comes from the factory are stamped on a nameplate (key 42, figure 6) attached to the actuator.

Educational Services

For information on available courses for 1061 Style H and J actuators, as well as a variety of other products, contact:

Emerson Process Management
 Educational Services, Registration
 P.O. Box 190; 301 S. 1st Ave.
 Marshalltown, IA 50158-2823
 Phone: 800-338-8158 or
 Phone: 641-754-3771
 FAX: 641-754-3431
 e-mail: education@emerson.com

Installation

When an actuator and valve are shipped together, the actuator is normally mounted on the valve. Follow the valve instructions when installing the control valve in the pipeline. If the actuator is shipped separately or if it is necessary to mount the actuator on the valve, perform the procedures presented in the Actuator Mounting section.

⚠ WARNING

To avoid personal injury, always wear protective gloves, clothing, and eyewear when performing any installation operations.

To avoid personal injury or property damage caused by bursting of pressure retaining parts, be certain the service conditions do not exceed the limits given in table 1 or on the nameplate. Use pressure limiting or pressure relieving devices to prevent the cylinder pressure from exceeding the maximum allowable cylinder operating pressure.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

Table 2. Output Shaft Diameters and Torque Limits for Actuators With H Mounting

ACTUATOR SIZE	OUTPUT SHAFT DIAMETER		TORQUE LIMIT FOR H MOUNTING	
	mm	Inches	N•m	Lbf•in
30	22.2	7/8	240	2120
	28.6	1-1/8	468	4140
	38.1	1-1/2	1110	9815
40, 60 & 68	28.6	1-1/8	468	4140
	38.1	1-1/2	1210	10,680
	50.8	2 ⁽¹⁾	2650	23,430

1. Coupling supplied for mating with either 44.5 or 50.8 mm (1-3/4 or 2-inch) keyed shaft.

Table 3. Acceptable Shaft Diameters and Torque Limits for Actuators with J Mounting

ACTUATOR SIZE	COUPLING AVAILABILITY BY KEYED SHAFT DIAMETER		TORQUE LIMIT FOR J MOUNTING	
	mm	Inches	N•m	Lbf•in
30	9.5	3/8	52	460
	12.7	1/2	69	610
	15.9	5/8	114	1010
	19.1	3/4	207	1830
	25.4	1	468	4140
40, 60, & 68	19.1	3/4	207	1830
	25.4	1	468	4140
	31.8	1-1/4	1030	9110
	38.1	1-1/2	1360	12,000

Table 4. Approximate Actuator Weights

ACTUATOR SIZE	ALUMINUM HOUSING CONSTRUCTION		CAST IRON HOUSING CONSTRUCTION	
	kg	Pounds	kg	Pounds
30	18	39	22	49
40	23	50	29	63
60	33	73	39	86
68	50	110	56	123

Actuator Mounting

Use the following steps to connect the actuator to a valve or other equipment. Unless otherwise specified, key numbers are shown in figure 6.

⚠ WARNING

Perform the steps in the **WARNING** at the beginning of the Maintenance section.

Note

For an actuator with an H mounting adaptation and a 22.2 through 38.1 mm (7/8 through 1-1/2 inch) output shaft, find dimensions and center of gravity information in figures 2 and 3, and approximate weights in table 4. This information is required for proper fabrication of the user-provided bracket and coupling.

1. For an actuator with an H mounting adaptation, attach an appropriate mounting bracket (not provided) to the mounting plate (key 23) with the cap screws (key 87). See figure 2 for mounting dimensions on the mounting plate.
2. Consult figure 4 for available mounting styles and positions. The actuator is normally positioned vertically with the valve or other equipment in a horizontal pipeline.

Note

If the milled flats or the coupling on the end of the actuator output shaft (key 94) are oriented such that the output shaft cannot accommodate the operated equipment shaft, refer to the Changing Positions portion of the Changing Actuator Mounting section. This procedure describes how the output shaft can be repositioned to accommodate the operated equipment shaft.

3. If using an actuator with a J mounting adaptation, note that the valve shaft coupling (key 97) is furnished with two keyways lettered A & B as shown in figure 5 (letters C and D on the coupling are not used and can be disregarded).

Align the appropriate keyway with the keyway in the operated equipment shaft. If using a Fisher butterfly valve, align the appropriate keyway on the coupling with the valve shaft keyway indicated in table 5. Then, install the woodruff key (key 98) in the shaft keyseat, and slide the coupling onto the shaft. It is helpful to apply a light coat of grease to the inside of the coupling before sliding it onto the shaft.

4. For an actuator with a J mounting adaptation, secure the mounting yoke (key 23) to the valve with the cap screws (key 87, not shown). For 31.8 and 38.1 mm (1-1/4 and 1-1/2 inch) valve shafts, place two spacers (key 99, not shown) between the mounting yoke and valve or other equipment during this step.
5. For an actuator with an H mounting adaptation and a 22.2 through 38.1 mm (7/8 through 1-1/2 inch) output shaft, slide the actuator (with the user-provided mounting bracket attached) into the user-provided coupling on the operated shaft. Then, secure the actuator to the operated equipment in the desired mounting position with appropriate fasteners, such as mounting cap screws. See figure 2 for output shaft dimensions.
6. For an actuator with an H mounting adaptation and a 50.8 mm (2-inch) output shaft (key 94, figure 7), note that the valve shaft coupling (key 97, figure 7) is furnished with two keyways lettered A and B as shown in figure 5 (letters C and D on the coupling are not used and can be disregarded). Align the appropriate keyway with the keyway in the operated equipment shaft. Then, install the woodruff key (key 98, not shown in figure 7) in the shaft keyseat, and slide the coupling onto the shaft using the appropriate coupling keyway (see table 5 and figure 5). It is helpful to apply a light coat of grease to the inside of the coupling before sliding it onto the shaft. Secure the actuator (user-provided mounting bracket) to the operated equipment in the desired mounting position with appropriate fasteners, such as mounting cap screws.
7. If the 1061 actuator is equipped with an auxiliary handwheel actuator, make certain that a cylinder bypass valve (key 68, figure 8) is used to equalize cylinder pressure during handwheel operation. Operating the handwheel actuator by itself against the force of differential cylinder pressures is difficult or even impossible. An installation of a bypass valve is shown in figure 8.

CAUTION

Attempting to pneumatically operate the 1061 actuator while an auxiliary manual actuator is engaged could damage the actuator shaft. Be certain the manual actuator is disengaged before pneumatically operating the 1061 actuator.

8. Follow the instructions given in the Adjustment section before proceeding to the loading connection portion of this section.

Table 5. Keyway Alignment Information⁽¹⁾

DESIRED ACTUATOR ACTION	DESIRED SHAFT ROTATION, DEGREES	ACTUATOR MOUNTING POSITION	COUPLING KEYWAY TO USE ⁽³⁾	VALVE SHAFT KEYWAY TO USE FOR Fishtail™ Disc Valves ⁽²⁾ (SEE FIGURE 6)			
				Clockwise to Close Valve Action ⁽⁴⁾		Counterclockwise to Close Valve Action ⁽⁴⁾	
				Flow Left to Right ⁽⁴⁾	Flow Right to Left ⁽⁴⁾	Flow Left to Right ⁽⁴⁾	Flow Right to Left ⁽⁴⁾
Push Down to Open (PDTO)	60 or 90	1	B	Nose	Tail	Tail	Nose
		2	A	Tail	Nose	Nose	Tail
		3	B	Tail	Nose	Nose	Tail
		4	A	Nose	Tail	Tail	Nose
Push Down to Close (PDTC)	60 ⁽⁵⁾ or 90	1	A	Tail	Nose	Tail	Nose
		2	B	Tail	Nose	Tail	Nose
		3	A	Nose	Tail	Nose	Tail
		4	B	Nose	Tail	Nose	Tail

1. For actuators with H mounting and 50.8 mm (2-inch) output shafts, and for actuators with J mounting.
 2. For conventional disc valves, use either valve shaft keyway.
 3. See figure 6 for reference coupling orientation to use with this table.
 4. When viewed from actuator side of valve.
 5. For 60-degree rotation with PDTC action, the coupling and actuator output shaft assembly will be offset 30 degrees clockwise (for actuator housing construction style B) or counterclockwise (for actuator housing construction Style A) in the lever when viewed from the splined end of the actuator shaft. 30 degrees is one spline tooth for 19.1 through 38.1 mm (3/8 through 1-1/2 inch) valve shafts.

Figure 2. Fisher 1061 Mounting Dimensions

ACTUATOR SIZE	H OR J MOUNTING					
	C	E	F	H	P	Y
	mm					
30	171	378	54	114	175	73
40	206	425	64	121	186	73
60	267	406	64	121	186	76
68	324	483	64	121	186	76
Inches						
30	6.75	14.88	2.12	4.50	6.88	2.88
40	8.12	16.75	2.50	4.75	7.31	2.88
60	10.50	16.00	2.50	4.75	7.31	3.00
68	12.75	19.00	2.50	4.75	7.31	3.00

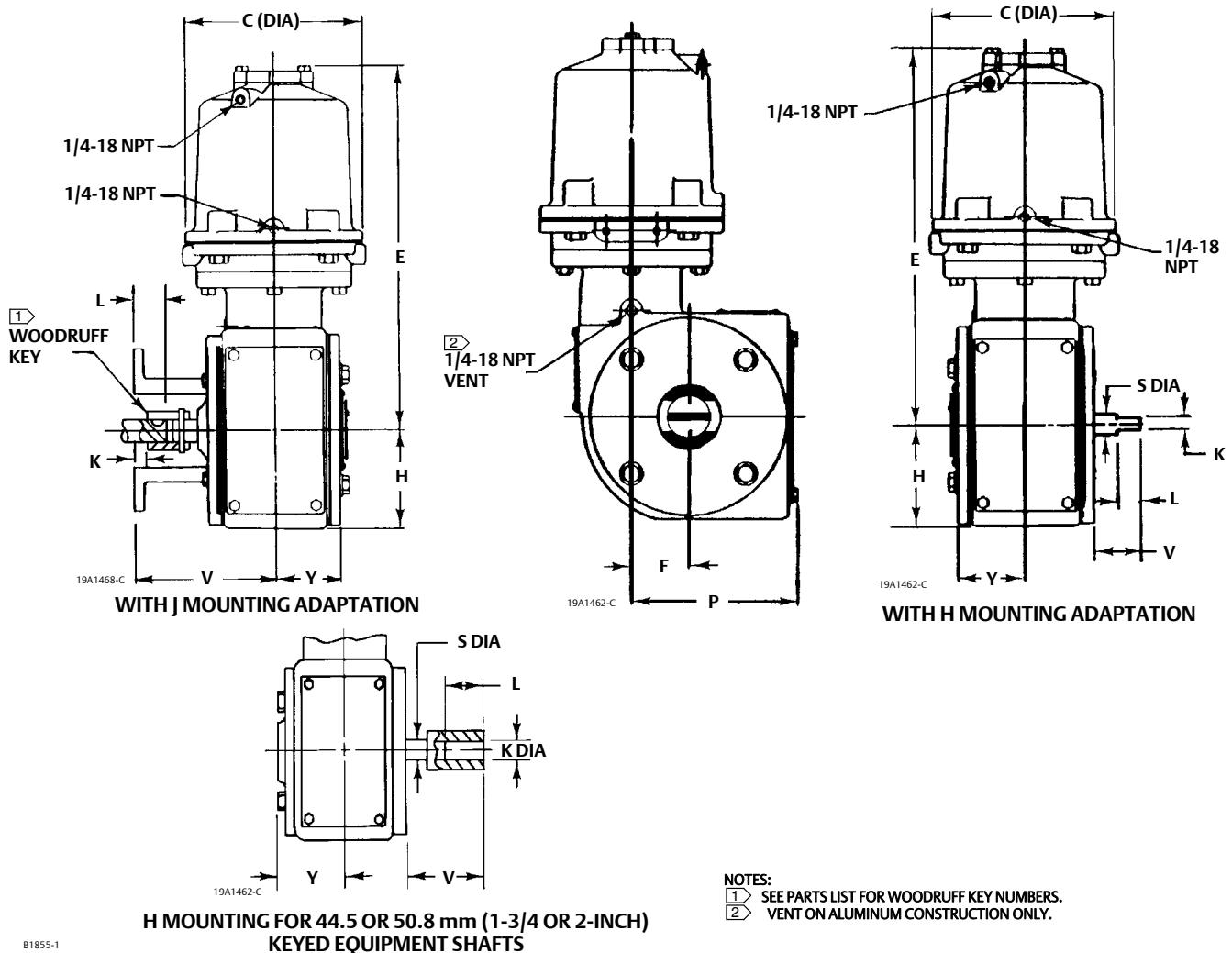
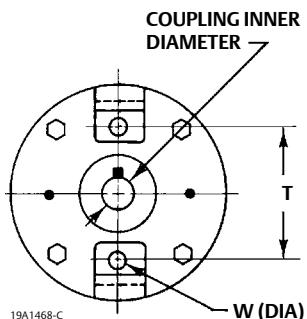


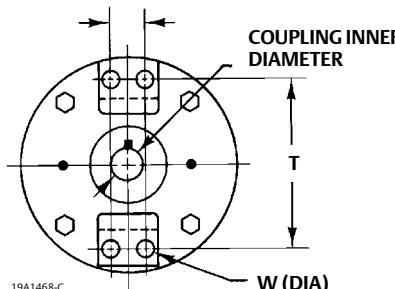
Figure 2. Fisher 1061 Mounting Dimensions (Continued)

J MOUNTING ⁽¹⁾								
Actuator Size	S (Valve Shaft Diameter)	Coupling Inner Diameter	V	L	K	T	U	W
mm								
30	9.5	9.53 9.58	136.7	33.3	15.7	117.3	---	11.2
	12.7	12.70 12.75	136.7	33.3	15.7	117.3	---	11.2
	15.9	15.90 15.95	160.3	42.9	25.4	146.1	31.8	11.2
30, 40, 60, & 68	19.1	19.05 19.10	160.3	42.9	20.6	146.1	31.8	11.2
	25.4	25.43 25.48	160.3	42.9	17.5	146.1	31.8	11.2
40, 60, & 68	31.8	31.75 31.80	147.6	63.5	30.2	209.6	50.8	17.5
	38.1	38.13 38.18	147.6	63.5	23.9	209.6	50.8	17.5
Inches								
30	3/8	0.375 0.377	5.38	1.31	0.62	4.62	---	0.44
	1/2	0.500 0.502	5.38	1.31	0.62	4.62	---	0.44
	5/8	0.626 0.628	6.31	1.69	1.00	5.75	1.25	0.44
30, 40, 60, & 68	3/4	0.750 0.752	6.31	1.69	0.81	5.75	1.25	0.44
	1	1.0010 1.0025	6.31	1.69	0.69	5.75	1.25	0.44
40, 60, & 68	1-1/4	1.250 1.252	5.81	2.50	1.19	8.25	2.00	0.69
	1-1/2	1.501 1.503	5.81	2.50	0.94	8.25	2.00	0.69

1. Tolerance for the coupling inner diameter is indicated by showing maximum and minimum dimensions.



19A1468-C
9.5 & 12.7 mm
(3/8 & 1/2 INCH) VALVE
SHAFTS WITH J MOUNTING

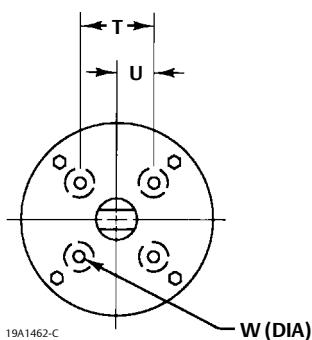


19A1468-C
15.9 THRU 38.1 mm
(5/8 THRU 1-1/2 INCH)
VALVE SHAFTS WITH
J MOUNTING

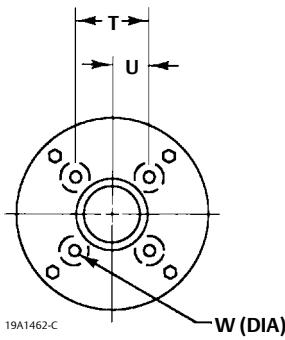
Figure 2. Fisher 1061 Mounting Dimensions (Continued)

H MOUNTING ⁽¹⁾							
Actuator Size	S (Actuator Output Shaft Diameter)	V	L	K	T	U	W
mm							
30	22.2	26.2	19.1	<u>15.75</u> 15.62	57.2	28.4	5/16-18 UNC
30, 40, 60, & 68	28.6	26.2	19.1	<u>22.10</u> 21.97	76.2	38.1	3/8-16 UNC
	38.1	38.1	28.4	<u>28.45</u> 28.32	88.9	44.5	1/2-13 UNC
40, 60, & 68	44.5 x 50.8	122.9	69.9	<u>44.45</u> 44.50	88.9	44.5	1/2-13 UNC
	50.8	122.9	69.9	<u>50.83</u> 50.90	88.9	44.5	1/2-13 UNC
Inches							
30	7/8	1.03	0.75	<u>0.620</u> 0.615	2.25	1.12	5/16-18 UNC
30, 40, 60, & 68	1-1/8	1.03	0.75	<u>0.870</u> 0.865	3.00	1.50	3/8-16 UNC
	1-1/2	1.50	1.12	<u>1.120</u> 1.115	3.50	1.75	1/2-13 UNC
40, 60, & 68	1-3/4 X 2	4.84	2.75	<u>1.750</u> 1.752	3.50	1.75	1/2-13 UNC
	2	4.84	2.75	<u>2.001</u> 2.004	3.50	1.75	1/2-13 UNC

1. Tolerance for the K dimension is indicated by showing maximum and minimum dimensions.



19A1462-C
22.2 THRU 38.1 mm
(7/8 THRU 1-1/2 INCH) OUTPUT
SHAFTS WITH H MOUNTING



19A1462-C
44.5 & 50.8 mm
(1-3/4 & 2 INCH)
KEYED EQUIPMENT SHAFTS WITH H MOUNTING

Figure 3. Center of Gravity Dimensions

ACTUATOR SIZE	CENTER OF GRAVITY DIMENSIONS			
	X		Y	
	mm	Inches	mm	Inches
30	54	2.12	137	5.4
40	64	2.50	112	4.4
60	64	2.50	91	3.6
68	64	2.50	155	6.1

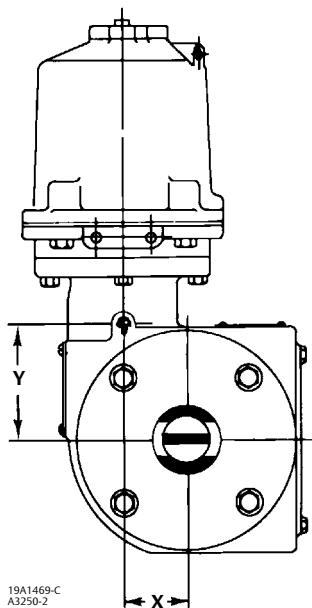
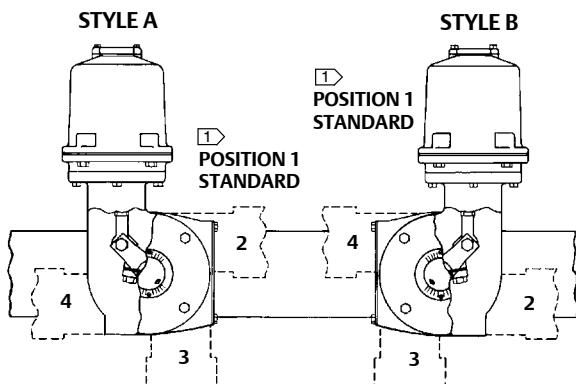


Figure 4. Actuator Housing Construction Styles and Mounting Positions

DESIRED ACTION OF		HOUSING CONSTRUCTION TO SPECIFY
Actuator	Valve Body or Other Equipment	
Push Down to Open (PDTO)	Clockwise to Close ⁽¹⁾	Style A
	Counterclockwise to Close ⁽¹⁾	Style B
Push Down to Close (PDTC)	Clockwise to Close ⁽¹⁾	Style B
	Counterclockwise to Close ⁽¹⁾	Style A

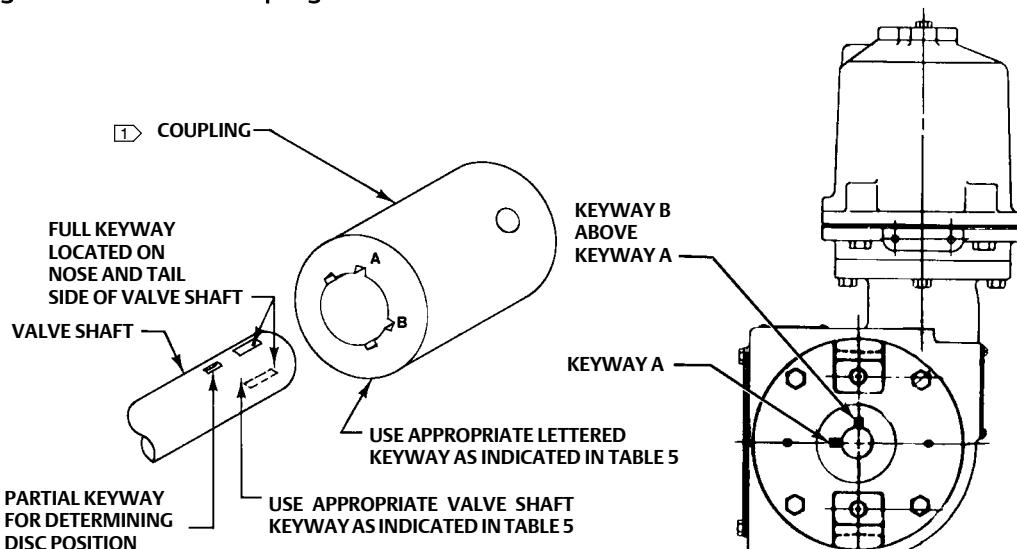
1. When viewed from actuator side of valve or other equipment.



NOTE:
① DOTTED LINES INDICATE ALTERNATE MOUNTING POSITIONS 2, 3, AND 4.

43A6506-A
A3248

Figure 5. Valve Shaft Coupling



EXPLODED VIEW OF VALVE SHAFT AND COUPLING

REFERENCE COUPLING ORIENTATION FOR TABLE 5

NOTE:

① FOR USE WITH J MOUNTING ADAPTATION [UP TO 38.1 mm (1-1/2 INCH) KEYED SHAFT DIAMETERS] AND H MOUNTING ADAPTATION [FOR 44.5 AND 50.8 mm(1-3/4 AND 2 INCH) KEYED SHAFT DIAMETERS].

19A1468-C
A3251-1

Pressure Connections

1. If a positioner is used, the pressure connections to the actuator are normally made at the factory. Actuators without positioners should have either a 4-way solenoid valve or a switching valve connected to the 1/4 NPT pressure connections located at the top and bottom of the actuator cylinder.
2. Connect either NPS 1/4 pipe or 3/8-inch tubing between the actuator pressure connections and the positioner or automatic controller. Keep the length of pipe or tubing as short as possible to avoid transmission lag in the control signal.

Table 6. Wrench Sizes Required for Actuator Adjustment, Inches

Actuator Size	Turnbuckle (Key 70)	Hex Nut (Key 11)	Hex Nut (Key 71)
30	1-1/8	3/4	1-1/8
40 & 60	1-5/16	1-1/8	1-5/16
68	1-7/8	1-1/8	1-7/8

3. When the actuator is completely installed and connected to the instrument, check for correct action (air-to-open or air-to-close) to match the controlling instrument. For successful operation, the actuator stem and operating shaft must move freely in response to the loading pressure change on the piston.

Adjustment

⚠ WARNING

Perform the steps in the WARNING at the beginning of the Maintenance section.

The only adjustment on the 1061 actuator is to make sure that the valve or other operated equipment is correctly closed when the actuator piston is against the travel stop. For accurate adjustment, the valve or other operated equipment must be removed from the pipeline.

If the actuator is equipped with an auxiliary manual handwheel actuator, make sure that the manual actuator is disengaged from the operated shaft and that the bypass valve (key 68, figure 8) is closed before performing adjustment procedures.

Perform the following steps to adjust the actuator turnbuckle. A regulated air supply will be required to stroke the actuator during this procedure. Also, when performing adjustment, refer to table 6 for the sizes of open-end wrenches required to loosen and tighten the hex nuts and turnbuckle. Key numbers referenced in this procedure are shown in figure 6.

1. Remove the access plate (key 72). Also remove the machine screws (key 73) if present.

Note

The cover (key 34) supports the outer end of the output shaft and should not be removed during actuator adjustment.

2. Stroke the actuator until the lower hex nut (key 11) can be reached through the access opening. Loosen the hex nut.

3. Stroke the actuator until the left-hand threaded upper hex nut (key 71) can be reached through the access opening. Loosen the hex nut.
4. Perform one of the following:
 - a. **For push-down-to-close action (extending piston rod closes operated equipment)**-- Slowly stroke the actuator to the down travel stop. Consult the appropriate instruction manual for determining the closed position of the valve or other operated equipment. Adjust the turnbuckle (key 70) until the closed position is reached. Lock this adjustment with the left-hand threaded hex nut (key 71). Stroke the actuator to the up travel stop, and tighten the lower hex nut (key 11). Tighten each hex nut to the torque value listed in table 7.
 - b. **For push-down-to-open action (extending piston rod opens operated equipment)**-- Stroke the actuator to the up travel stop. Consult the appropriate instruction manual for determining the closed position of the valve or other operated equipment. Check the valve position with respect to its properly closed position. Stroke the actuator until the turnbuckle (key 70) can be reached through the access opening. Adjust the linkage. Stroke the actuator to the up travel stop again, and check the new adjustment. Continue this procedure until the operated equipment is in the closed position when the actuator piston is resting against the up travel stop. Tighten the lower hex nut (key 11). Stroke the actuator down, and tighten the left-hand threaded hex nut (key 71). Tighten each hex nut to the torque value listed in table 7.
5. Replace the access plate (key 72) and install the machine screws (key 73) if used.

Note

Skip the following step if an auxiliary handwheel actuator is mounted on the 1061 actuator.

6. Loosen the self-tapping screws (key 39), and adjust the travel indicator (key 38). Retighten the self-tapping screws.

CAUTION

If using a handwheel actuator, the splines of the 1061 actuator shaft could be damaged if excessive torque is applied to the shaft by the manual actuator while the 1061 actuator is stopped at either end of travel. To protect the shaft, perform the travel stop adjustment procedure found in the separate handwheel actuator instruction manual.

Principle of Operation

Piston movement is accomplished by loading air pressure on one side of the piston, and unloading air pressure from the other side of the piston. If no positioner is used, a loading device, such as a 4-way switching valve, must be provided. Such a device is not furnished as part of the actuator.

Consult the separate positioner instruction manual for the 1061 actuator principle of operation with positioner.

Maintenance

Actuator parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement depends upon the severity of service conditions. Instructions are given below for disassembly and replacement of parts.

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or uncontrolled movement of parts. Before performing any maintenance operations:

- Do not remove the actuator from the valve while the valve is still pressurized.
- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, even when the valve has been removed from the pipeline. Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Disassembly

The following procedure describes how the actuator can be disassembled for inspection and replacement of parts. When inspection or repairs are required, disassemble only those parts necessary to accomplish the job. Key numbers referenced in this procedure are shown in figure 6 unless otherwise specified.

1. Bypass the valve or other operated equipment. Relieve all actuator loading pressure, and remove the tubing or pipe from the top of the actuator.
2. Remove the positioner, if one is used.
3. Mark the orientation of the travel indicator (key 38) with respect to the travel indicator scale (key 36). Then, unscrew the cap screws and washers (keys 35 and 76), and remove the cover (key 34). If a manual handwheel actuator is used, it will be removed with the cover.
4. Remove the retaining ring (key 31), and slide the hub (key 30) from the cover (key 34) or, if a manual handwheel actuator is used, remove the cover from the manual handwheel actuator connector. If disassembly of the manual handwheel actuator is required, refer to the separate manual actuator instruction manual for instructions.
5. Check the condition of the bearing (key 32). If replacement of the bearing is necessary, the travel indicator scale (key 36) must first be removed by removing the self-tapping screws (key 37). Mark the orientation of the travel indicator scale on the cover before removing it.

CAUTION

Do not use a hammer or similar tool to drive the lever (key 28) off the output shaft. Driving the lever could damage operated equipment. For valves, driving the lever could move the valve disc and bearings away from the centered position causing subsequent damage to valve parts.

If necessary, use a wheel puller to remove the lever. It is permissible to tap the wheel puller screw lightly to loosen the lever, but hitting the screw with excessive force could damage the operated equipment.

6. For an actuator with an H mounting adaptation and a 22.2 through 38.1 mm (7/8 through 1-1/2 inch) output shaft, unscrew the cap screws (key 87) and remove the actuator from the operated equipment. Mark the orientation of the lever (key 28) with respect to the output shaft (key 94). This marking is used during reassembly to allow for proper lever/output shaft positioning. Then, loosen the cap screw (key 29) so that the output shaft is free to slide off the lever. With the lever and output shaft properly marked, unscrew the cap screws (key 24) and remove the mounting plate (key 23) and output shaft (key 94) assembly from the actuator housing (key 21). If necessary, remove the retaining ring (key 95) and separate the output shaft from the mounting plate. For 50.8 mm (2-inch) output shafts, refer to step 7 for this procedure.
7. For an actuator with either a J mounting adaptation (see figure 6), or an H mounting adaptation with a 50.8mm (2-inch) output shaft (see figure 7), proceed as follows:

Remove the cap screws (key 87, not shown in figure 6) and remove the actuator from the operated equipment. For an actuator with J mounting and a 31.8 or 38.1 mm (1-1/4 or 1-1/2 inch) valve shaft diameter, two spacers (key 99, not shown in figure 6) are also removed with the cap screws (key 87). When separating the output shaft (key 94) and coupling (key 97) from the operated shaft, remember to remove the woodruff key (key 98, not shown in figure 7) from the operated shaft keyway. Mark the orientation of the lever (key 28, figure 6) with respect to the output shaft (key 94). This marking is used during reassembly to allow for proper lever/output shaft positioning. Then, loosen the cap screw (key 29, figure 6) so that the output shaft is free to slide off the lever. With the lever and output shaft properly marked, unscrew the cap screws (key 24) and remove either the mounting yoke (key 23, figure 6 for J mounting) or the mounting plate (key 23, figure 7 for H mounting) plus the attached output shaft (key 94) from the actuator housing (key 21). If necessary, remove the retaining ring (key 95) and slide the mounting yoke or mounting plate off the output shaft.

8. Check the bearing (key 81) in the mounting yoke or the mounting plate (key 23). Press out and replace the bearing if necessary.
9. Heat the hex nut (key 14) to 177°C (350°F) long enough for the thread-locking adhesive (medium strength (key 92) to lose its holding strength. Then, remove the cap screw and hex nut (keys 13 and 14), and remove the lever (key 28) from the housing.
10. Remove the rod end bearing and the hex nut (keys 12 and 11), and then the turnbuckle and the hex nut (keys 70 and 71).
11. For size 30, 40, and 68 actuators only, unscrew the cap screws (key 6) and remove the cylinder cap (key 4). Inspect and, if necessary, replace the O-ring (key 5).
12. Remove the cap screws (key 3) and slide the cylinder assembly (key 1) from the cylinder flange (key 2).
13. Pull the piston (key 7) and the piston rod (key 10) from the cylinder assembly.
14. Check and, if necessary, replace the O-rings (keys 8 and 16).
15. To separate the piston (key 7) from the piston rod (key 10), unscrew the cap screw to hex nut (key 9) and remove the washer (key 77).
16. Unscrew the cap screws (key 22) and remove the cylinder flange (key 2), the sliding seal (key 19), and the seal support cylinder (key 20). For actuators with 60-degree rotation, a travel stop (key 15) will also be removed with these parts.
17. Check and, if necessary, replace the O-rings (keys 17 and 18) and the thrust washer (key 74).

Assembly

1. Apply lithium grease (key 93) to the surfaces of the sliding seal (key 19). Then, install the seal support cylinder (key 20), the thrust washer (key 74), the sliding seal, and the cylinder flange (key 2) and secure these parts with the cap screws (key 22). Tighten the cap screws to the torque value listed in table 7. For actuators with 60-degree rotation, a travel stop (key 15) will be threaded into the cylinder flange.
2. Apply lithium grease (key 93) to the cylindrical surface of the piston rod (key 10) and apply anti-seize sealant (key 91) to the tapered end of the piston rod. Attach the piston and washer (keys 7 and 77) to the piston rod, and secure them with the cap screw or hex nut (key 9). Tighten the cap screw or hex nut to the torque value listed in table 7.
3. Insert the piston and piston rod assembly down through the sliding seal (key 19). Attach the hex nut (key 71), the turnbuckle (key 70), the hex nut (key 11), and the rod end bearing (key 12) to the piston rod assembly. Tighten both hex nuts to the torque value listed in table 7.

4. Apply lithium grease (key 93) to the inside wall of the cylinder, and then attach the cylinder assembly (key 1) to the cylinder flange with the cap screws (key 3). For size 30, 40, and 68 actuators only, replace the cylinder cap (key 4), and secure it to the cylinder assembly with the cap screws (key 6). Tighten all cap screws to the torque value listed in table 7.
5. If the bearing (key 81) was removed, press in the new bearing. The end of the bearing should be flush with the outside of the mounting yoke or mounting plate (key 23).
6. For an actuator with an H mounting adaptation and a 22.2 through 38.1 mm (7/8 through 1-1/2 inch) output shaft, install the output shaft (key 94) through the mounting plate (key 23) and secure it with the retaining ring (key 95). Then, attach the mounting plate and output shaft assembly to the actuator housing (key 21) with the cap screws (key 24). Tighten the cap screws to the appropriate torque value listed in table 7.
7. For an actuator with an H mounting adaptation and a 50.8mm (2-inch) output shaft, refer to figure 7. Install the output shaft (key 94) with attached coupling (key 97) through the mounting plate (key 23) and secure it with the retaining ring (key 95). Attach the mounting plate and output shaft assembly to the actuator housing with the cap screws (key 24). Tighten the cap screws to the appropriate torque value listed in table 7.

Table 7. Bolting Torques

KEY NUMBER	SIZE 30		SIZE 40 & 60		SIZE 68	
	N·m	Lbf·ft	N·m	Lbf·ft	N·m	Lbf·ft
3	102	75	102	75	102	75
6	14	10	14	10	14	10
9	61	45	136	100	248	257
11	34	25	102	75	102	75
13	81	60	271	200	271	200
22	23	17	68	50	68	50
24	34	25	81	60	81	60
29	81	60	271	200	271	200
35	34	25	81	60	81	60
41	14	10	14	10	14	10
71	102	75	163	120	253	260

8. For an actuator with a J mounting adaptation, refer to figure 6. Install the output shaft (key 94) with attached coupling (key 97) through the mounting yoke (key 23) and secure it with the retaining ring (key 95). Attach the mounting yoke and output shaft assembly to the actuator housing (key 21) with the cap screws (key 24). Tighten the cap screws to the appropriate torque value listed in table 7.
9. Apply lithium grease (key 93) to the output shaft splines. Then, align the lever (key 28) and output shaft so that the marking that was made in step 6 or 7 of the disassembly procedure is oriented correctly. Slide the lever into place. When installing the lever, align the bolt holes in the lever as close as possible with the hole in the rod end bearing (key 12). Temporarily rotate the lever and output shaft until the rod end bearing no longer interferes with further installation of the lever. Then, slide the lever as far as it can go onto the output shaft.
10. Clamp the lever to the output shaft with the cap screw (key 29). Tighten the cap screw to the torque value listed in table 7.
11. Rotate the lever to align with the rod end bearing (key 12). This connection can be aided by carefully stroking the actuator with a regulated air source.
12. Apply thread-locking adhesive (medium strength) (key 92) to the threads of the cap screw (key 13). Then, connect the lever and the rod end bearing with the cap screw and hex nut (keys 13 and 14). Tighten the cap screw to the torque value listed in table 7.
13. If a positioner is used, consult the separate positioner instruction manual for proper installation.
14. Install the hub (key 30) and the bearing (key 32) into the cover (key 34), and secure them with the retaining ring (key 31).
15. Install the travel indicator scale (key 36) so that the markings on the scale and cover that were made in step 5 of the disassembly procedure are oriented correctly. Secure the travel indicator scale to the cover with the self-tapping screws (key 37). Then install the travel indicator (key 38), and secure it with the self-tapping screws (key 39).
16. Note the position of the valve or other operated equipment and the direction of rotation.

- a. If no handwheel actuator is used, position the travel indicator (key 38) so that the markings on the travel indicator and travel indicator scale that were made in step 3 of the disassembly procedure are oriented correctly. Then, replace the cover (key 34) and secure it with the cap screws and washers (key 35 and 76). If the holes in the cover and housing do not align, temporarily loosen the cap screws (key 24) and shift the housing slightly. Tighten the cap screws to the torque value listed in table 7.
- b. If the actuator is equipped with a manual handwheel actuator, refer to the separate instruction manual for mounting instructions.

17. Follow the instructions in the Actuator Mounting portion of the Installation section for correct actuator mounting and adjustment. Remember to replace the access plate (key 72) when performing these procedures.

Changing Actuator Mounting

The actuator is normally positioned vertically in a horizontal pipeline. However, there are two possible mounting styles and four possible positions for each style (see figure 4). Key numbers referenced in the following procedures are shown in figure 6 unless otherwise specified.

⚠ WARNING

Perform the steps in the WARNING at the beginning of the Maintenance section.

Use the following procedures along with figure 6 for key number references to convert from style A to style B or vice-versa or to change the mounting position.

Changing Styles

1. Unscrew the cap screws and washers (key 35 and 76), and remove the cover (key 34). If an optional manual handwheel actuator is used, it will be removed with the cover.
2. Heat the hex nut (key 14) to 177°C (350°F) long enough for the thread locking adhesive (medium strength) (key 92) to lose its holding strength. Then, remove the cap screw and hex nut (keys 13 and 14).
3. Loosen the cap screw (key 29).

CAUTION

Do not use a hammer or similar tool to drive the lever (key 28) off the output shaft. Driving the lever could damage operated equipment. For valves, driving the lever could move the valve disc and bearings away from the centered position causing subsequent damage to valve parts.

If necessary, use a wheel puller to remove the lever. It is permissible to tap the wheel puller screw lightly to loosen the lever, but hitting the screw with excessive force could damage the operated equipment.

4. Mark the side of the lever (key 28) that is nearest to the end of the output shaft (key 94). This marking is used during reassembly to determine which side of the lever should be inserted into the actuator housing first. When the lever is marked, remove the lever.
5. For an actuator with a J mounting adaptation,
 - a. Unscrew the cap screws (key 24), and remove the actuator housing (key 21) from the mounting yoke (key 23).

- b. Rotate the actuator housing 180 degrees, maintaining the appropriate position (1, 2, 3, or 4), and place the actuator onto the mounting yoke (key 23).
 - c. Secure the actuator housing to the mounting yoke with the cap screws (key 24). Tighten the cap screws to the torque value listed in table 7.
6. For an actuator with an H mounting adaptation,
 - a. Unscrew the cap screws (key 87) and remove the actuator assembly from its mounting bracket.
 - b. Unscrew the cap screws (key 24) and remove the mounting plate (key 23) and output shaft (key 94) assembly from the actuator housing. Remount the assembly on the opposite side of the actuator, and secure it to the housing with the cap screws (key 24). Tighten the cap screws to the torque value listed in table 7.
 - c. Rotate the actuator housing 180 degrees, maintaining the appropriate position (1, 2, 3, or 4) and secure the actuator housing to the mounting bracket with the cap screws (key 87). Tighten the cap screws to the torque value listed in table 7.
7. Install the lever (key 28) as follows:
 - a. For push-down-to-open action, rotate the operated equipment to the fully closed position.
 - b. For push-down-to-close action, rotate the operated equipment to the fully open position.
 - c. With the operated equipment oriented correctly, slide the lever onto the output shaft (key 94) with the end marked in step 4 inserted first. When installing the lever, align the bolt holes in the lever as close as possible with the hole in the rod end bearing (key 12).
 - d. Temporarily rotate the lever and output shaft until the rod end bearing no longer interferes with further installation of the lever. Then, slide the lever as far as it can go onto the output shaft. Clamp the lever to the output shaft with the cap screw (key 29). Tighten the cap screw to the torque value listed in table 7.
 - e. Rotate the lever and output shaft back to the original position (i.e., operated equipment fully closed for push-down-to-open action or operated equipment fully open for push-down-to-close action). Then, adjust the rod end bearing so that it can be attached to the lever.
8. Apply thread-locking adhesive (medium strength) (key 92) to the threads of the cap screw (key 13).
9. Connect the lever (key 28) and the rod end bearing (key 12) with the cap screw and hex nut (keys 13 and 14). This connection can be aided by stroking the actuator from its up travel stop with a regulated air source. Tighten the cap screw to the torque value listed in table 7.
10. Note the position of the valve or other operated equipment and direction of rotation.
 - a. Position the travel indicator (key 38) accordingly. Replace the cover (key 34), and secure it with the cap screws and washers (keys 35 and 76). If the holes in the cover and housing (key 21) do not align, use a regulated air source to move the actuator slightly off the up travel stop. If hole alignment cannot be obtained in this manner, temporarily loosen the cap screws (key 24), and shift the housing slightly. Do not stroke the actuator while the cover is off. Tighten both sets of cap screws to the torque values listed in table 7.
 - b. If a manual handwheel actuator is used, refer to the separate instruction manual for mounting instructions.
11. Follow the instructions in the Adjustment section for turnbuckle adjustment.

Changing Positions

1. Unscrew the cap screws and washers (keys 35 and 76), and remove the cover (key 34). If an optional manual handwheel actuator is used, it will be removed with the cover.
2. Mark the orientation of the lever (key 28) with respect to the output shaft (key 94). This marking is used during reassembly to allow for proper lever/output shaft positioning. When the lever and output shaft are properly

marked, heat the hex nut (key 14) to 177°C (350°F) long enough for the thread locking adhesive (medium strength) (key 92) to lose its holding strength. Then, remove the cap screw and hex nut (keys 13 and 14).

CAUTION

Do not use a hammer or similar tool to drive the lever (key 28) off the output shaft. Driving the lever could damage operated equipment. For valves, driving the lever could move the valve disc and bearings away from the centered position causing subsequent damage to valve parts.

If necessary, use a wheel puller to remove the lever. It is permissible to tap the wheel puller screw lightly to loosen the lever, but hitting the screw with excessive force could damage the operated equipment.

3. Loosen the cap screw (key 29) and remove the lever (key 28) from the output shaft (key 94).
4. For an actuator with a J mounting adaptation,
 - a. Unscrew the cap screws (key 24), and remove the actuator housing (key 21) from the mounting yoke (key 23).
 - b. Rotate the actuator housing to the new position (1, 2, 3, or 4).
 - c. Secure the actuator housing to the mounting yoke with the cap screws (key 24). Tighten the cap screws to the torque value listed in table 7.
5. For an actuator with an H mounting adaptation,
 - a. Unscrew the cap screws (key 87) and loosen the actuator assembly from its mounting bracket.
 - b. Rotate the actuator housing to the new position (1, 2, 3, or 4).
 - c. Secure the actuator housing to the mounting bracket with the cap screws (key 87). Tighten the cap screws to the torque value listed in table 7.
6. Referring to the alignment marks that were made in step 2, install the lever (key 28) onto the output shaft (key 94) as follows:
 - a. If the new actuator position is 90 degrees clockwise from the previous actuator position, install the lever so that its orientation mark is located 90 degrees clockwise from the mark on the output shaft.
 - b. If the new actuator position is 90 degrees or 180 degrees counterclockwise from the previous position, install the lever so that its orientation mark is located either 90 degrees (for 90 degrees) or 180 degrees (for 180 degrees) counterclockwise (respectively) from the mark on the output shaft.
 - c. Slide the lever onto the output shaft with the bolt holes in the lever aligned as closely as possible with the hole in the rod end bearing (key 12). Then, temporarily rotate the lever and output shaft until the rod end bearing no longer interferes with further installation of the lever, and slide the lever as far as it can go onto the output shaft. Clamp the lever to the output shaft with the cap screw (key 29). Tighten the cap screw to the torque value listed in table 7.
 - d. Rotate the lever and output shaft back to the original position, and then adjust the rod end bearing so that it can be attached to the lever.
7. Apply thread-locking adhesive (medium strength) (key 92) to the threads of the cap screw (key 13).
8. Connect the lever (key 28) and the rod end bearing (key 12) with the cap screw and hex nut (keys 13 and 14). This connection can be aided by stroking the actuator from its up travel stop with a regulated air source. Tighten the cap screw to the torque value listed in table 7.
9. Note the position of the valve or other operated equipment and direction of rotation.

a. Position the travel indicator (key 38) accordingly. Replace the cover (key 34), and secure it with the cap screws and washers (keys 35 and 76). If the holes in the cover and housing (key 21) do not align, use a regulated air source to move the actuator slightly off the up travel stop. If hole alignment cannot be obtained in this manner, temporarily loosen the cap screws (key 24), and shift the housing slightly. Do not stroke the actuator while the cover is off. Then, tighten both sets of cap screws to the torque values listed in table 7.

b. If a manual handwheel actuator is used, refer to the separate instruction manual for mounting instructions.

10. Follow the instructions in the Adjustment section for turnbuckle adjustment.

Parts Ordering

When corresponding with your Emerson Process Management sales office about this equipment, refer to the serial number found on the actuator nameplate (key 42, figure 6). Also, specify the complete 11-character part number from the following parts list when ordering replacement parts.

⚠ WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher valve, because they may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.

Repair Kits

Key	Description	Part Number
	Kits include keys 5, 8, 16, 17, 18, and 56.	
Size 30		R1061X00302
Size 40		R1061X00402
Size 60		R1061X00602
Size 68		R1061X00682

Key	Description	Part Number
4	Cylinder Cap, aluminum (for sizes 30, 40, & 68 only)	
5*(1)	O-Ring, nitrile (for sizes 30, 40, & 68 only)	10A3800X012
6	Cap Screw, pl steel (2 req'd) (for sizes 30, 40, & 68 only)	
7	Piston, aluminum	
8*(1)	O-Ring, nitrile	
	Size 30	1H862106992
	Size 40	1H862206992
	Size 60	1H862406992
	Size 68	1H862506992
9	Cap Screw, pl steel	
9	Hex Nut, pl steel	
	Size 68 only	
10	Piston Rod, pl S41600 (416 SST), heat treated	
11	Hex Nut, pl steel	
12	Rod End Bearing, pl steel/stainless steel	
13	Cap Screw, pl steel	
14	Hex Nut, pl steel	
15	Travel Stop, steel (for 60-degree rotation only)	
16*(1)	O-Ring, nitrile	
	Size 30	1H862006992
	Size 40	1D444806992
	Size 60	1H862306992
	Size 68	1H862506992
17*(1)	O-Ring, nitrile	
	Size 30	1B8855X0042
	Sizes 40 & 60	1H8498X0022
	Size 68	1D3483X0012
18*(1)	O-Ring, nitrile	
	Size 30	12A9480X012
	Sizes 40 & 60	1V3234X0012
	Size 68	13A0824X012
19	Sliding Seal, alum/PTFE anodize	

Parts List

Note

Part numbers are shown for recommended spares only. For part numbers not shown, contact your Emerson Process Management sales office.

Key	Description	Part Number

Actuator

- 1 Cylinder Assembly, aluminum/stainless steel
- 2 Cylinder Flange, aluminum
- 3 Cap Screw, pl steel

*Recommended spare parts
1. Included in repair kit.

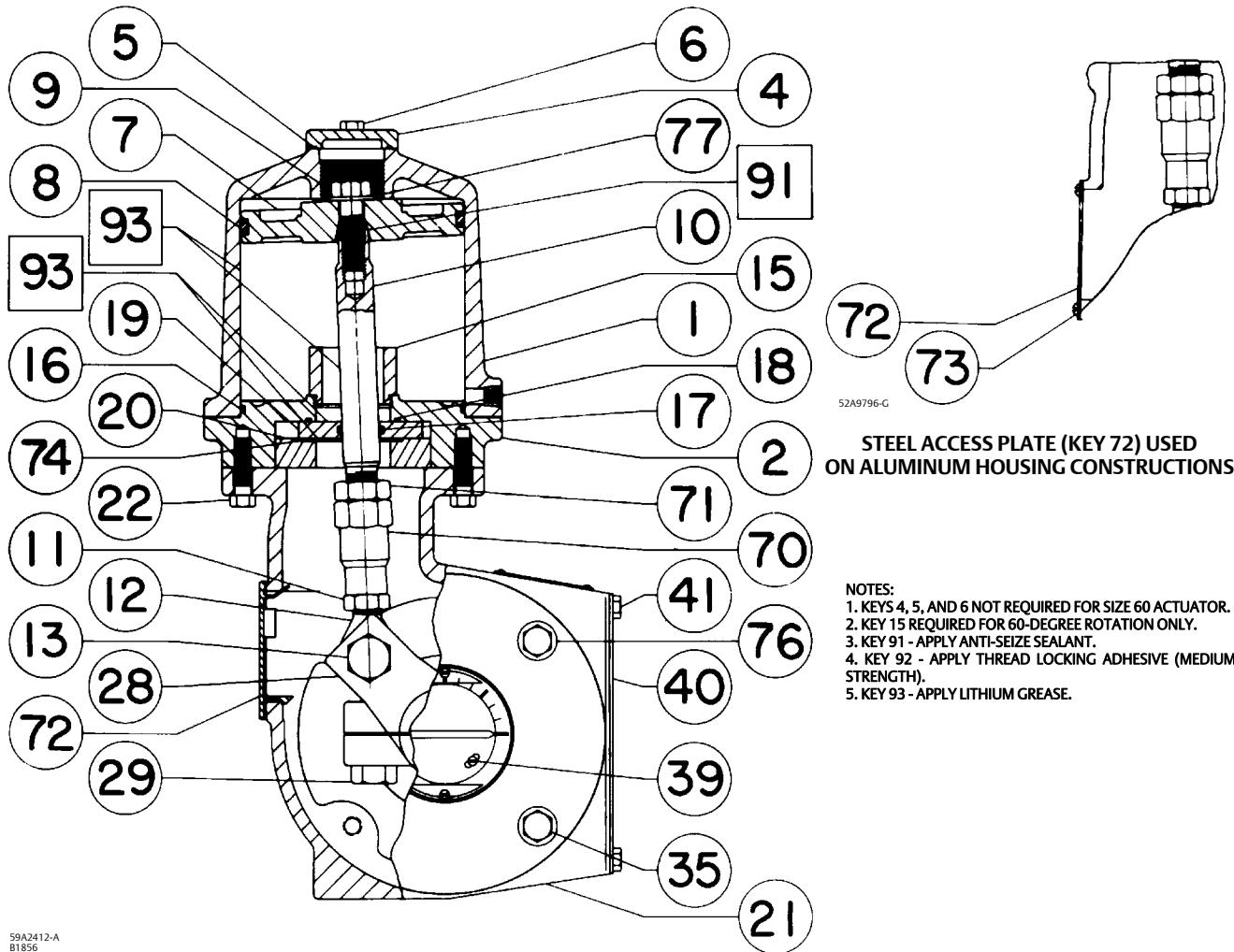
Key	Description	Part Number	Key	Description	Part Number
20	Seal Support Cylinder, aluminum		65	Pipe Plug, steel (2 req'd) (not req'd w/positioner)	
21	Housing, cast iron		66	Pipe Cross, malleable iron (2 req'd)	
22	Cap Screw, pl steel		67	Tubing, copper 3/8 in O.D.	
23	Mounting Plate, steel		68	Bypass Valve, brass	
23	Mounting Yoke, cast iron		70	Tumbuckle, pl steel	
24	Cap Screw, pl steel (4 req'd)		71	Hex Nut, pl steel	
28	Lever, ductile iron		72	Access Plate	
29	Cap Screw, pl steel		73	Machine Screw, pl steel(4 req'd)	
30	Hub, S41600 (416 SST) (not req'd w/handwheel)		74	Thrust Washer, PTFE	
31	Retaining Ring, pl steel (not req'd w/handwheel)		76	Washer, pl steel	
32*	Bearing, fiberglass		77	Washer, pl steel	
	Size 30	12A9373X012	81*	Bearing, PTFE	
	Sizes 40, 60, & 68	12A9374X012		For an actuator w/ H mounting 22.2 mm (7/8-inch) actuator output shaft Size 30	12A9557X012
34	Cover			28.6 mm (1-1/8 inch) actuator output shaft Sizes 30, 40, 60, & 68	12A9775X012
35	Cap Screw, pl steel W/o handwheel			38.1 mm (1-1/2 inch) actuator output shaft Sizes 30, 40, 60, & 68	12A9559X012
36	Travel Indicator Scale, stainless steel (not req'd w/handwheel)			50.8 mm (2-inch) actuator output shaft Sizes 40, 60, & 68	12A9715X012
37	Self Tapping Screw, pl steel (2 req'd)		For an actuator w/ J mounting 9.5,12.7,& 15.9 mm (3/8,1/2,&5/8 inch) valve shaft diameters Size 30	12A9555X012	
38	Travel Indicator, stainless steel (not req'd w/handwheel)		19.1 & 25.4 mm (3/4 & 1-inch)valve shaft diameters Sizes 30, 40, 60, & 68	12A9775X012	
39	Self-Tapping Screw, pl steel (2 req'd) (not req'd w/ handwheel)		31.8 & 38.1 mm (1-1/4 & 1-1/2 inch) valve shaft diameters Sizes 40, 60, & 68	12A9559X012	
39	Cap Screw, pl steel (2 req'd)		83	Pipe Tee, galvanized malleable iron (use w/ 376 trip valve) (not shown)	12A9555X012
40	Plate, steel (not req'd w/ positioner)		87	Cap Screw, pl steel(4 req'd)	
41	Cap Screw, steel pl (4 req'd) (not req'd w/ positioner)		91	Anti-seize sealant (not furnished with actuator)	
42	Nameplate, stainless steel		92	Thread Locking Adhesive (Medium Strength) (not furnished with actuator)	
43	Drive Screw, stainless steel (2 req'd)		93	Lithium Grease (not furnished with actuator)	
55	Vent Screen (not shown)		94	Output Shaft, S17400 (17-4PH SST) (heat-treated)	
56*(1)O-Ring, nitrile (for sizes 30, 40 & 68 only) (not shown)		1C853806992	95	Retaining Ring, pl carbon steel	
			96	Pin, alloy steel	
62	Connector, brass		97	Coupling, stainless steel	
63	Elbow, brass		98*	Woodruff Key	See following table
64	Pipe Nipple, steel	1C488226232	99	Spacer, steel (not shown)	

Note

Key numbers 62 thru 68 and key 83 are used with bypass only.

62	Connector, brass	
63	Elbow, brass	
64	Pipe Nipple, steel	

Figure 6. Fisher 1061 Actuator with Typical H and J Mounting Adaptations



Key 98* Woodruff Key for Actuator with H Mounting Adaptation, Alloy Steel

ACTUATOR SIZE	KEYED SHAFT COUPLING DIAMETER		WOODRUFF KEY NUMBER	PART NUMBER
	mm	Inches		
40, 60, & 68	44.5	1-3/4	1211	F1358231252
	50.8	2	1022-1	F1366131252

Key 98* Woodruff Key for Actuator with J Mounting Adaptation, Alloy Steel

ACTUATOR SIZE	KEYED SHAFT COUPLING DIAMETER		WOODRUFF KEY NUMBER	PART NUMBER
	mm	Inches		
30	9.5	3/8	304	F1357631252
	12.7	1/2	304	F1357631252
	15.9	5/8	404	F1357731252
30, 40, 60, & 68	19.1	3/4	406	F1357831252
	25.4	1	607	F1357931252
40, 60, & 68	31.8	1-1/4	809	F1358031252
	38.1	1-1/2	811	F1358131252

Figure 6. Fisher 1061 Actuator with Typical H and J Mounting Adaptations (Continued)

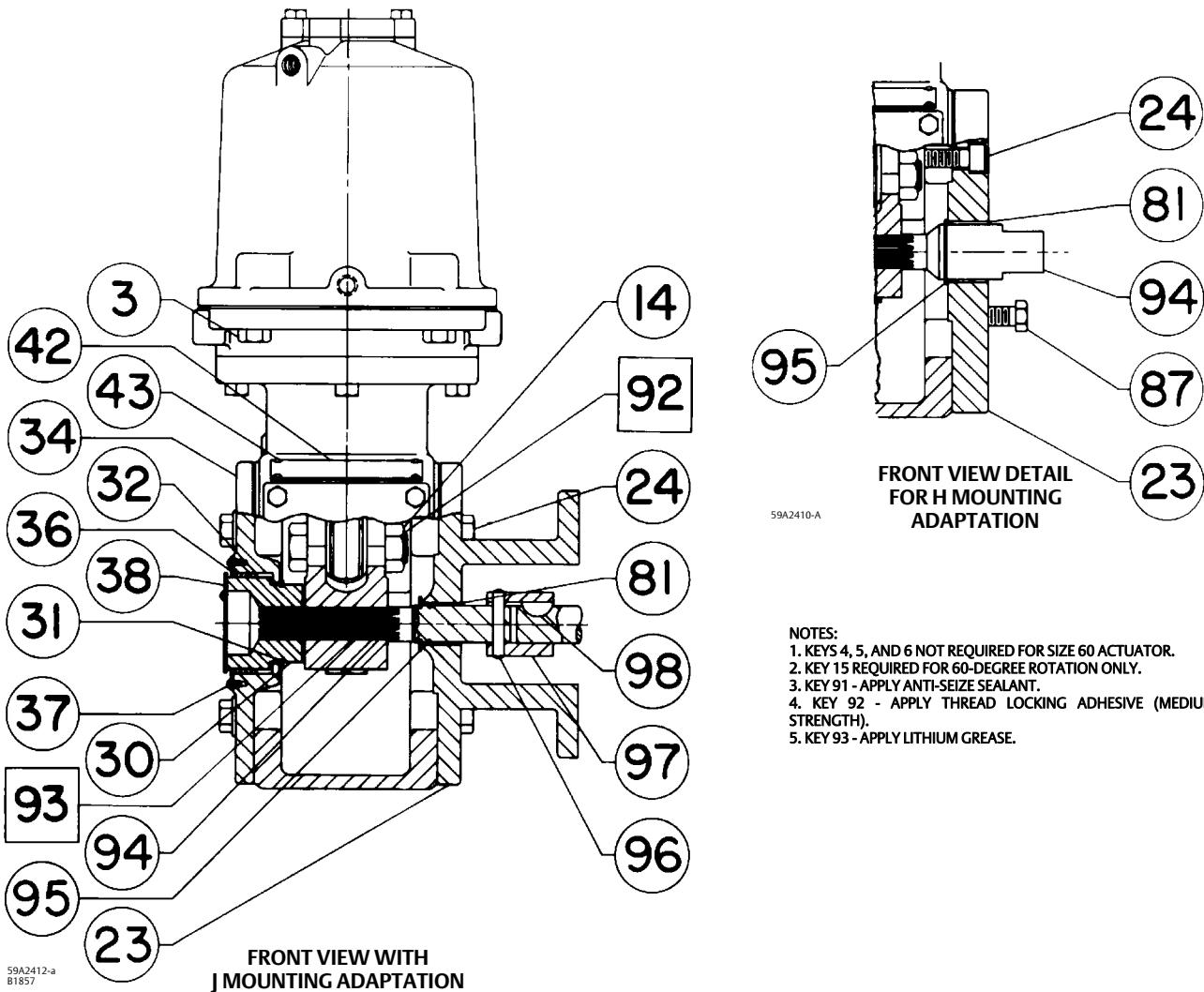


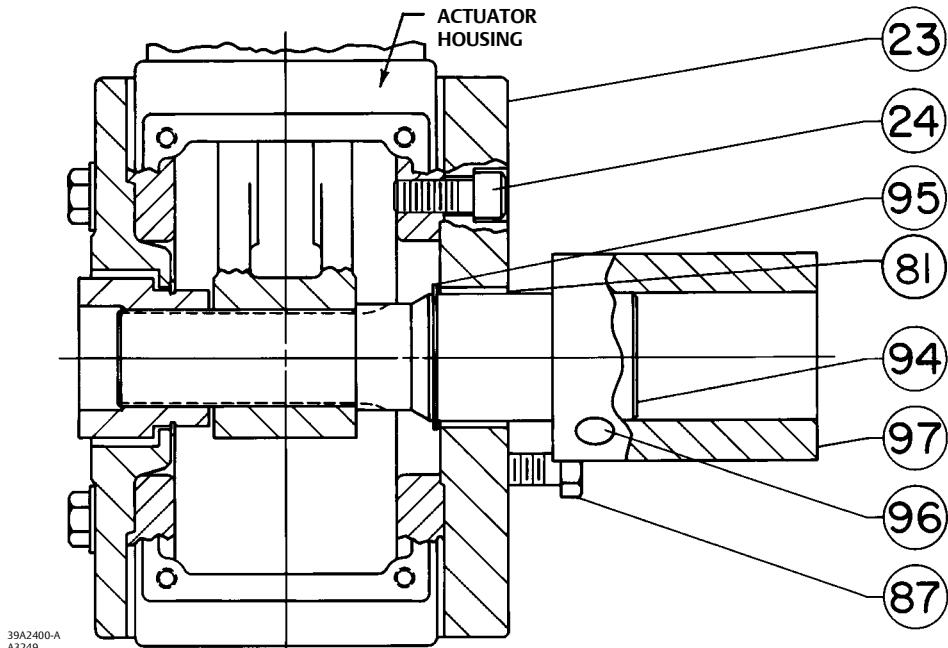
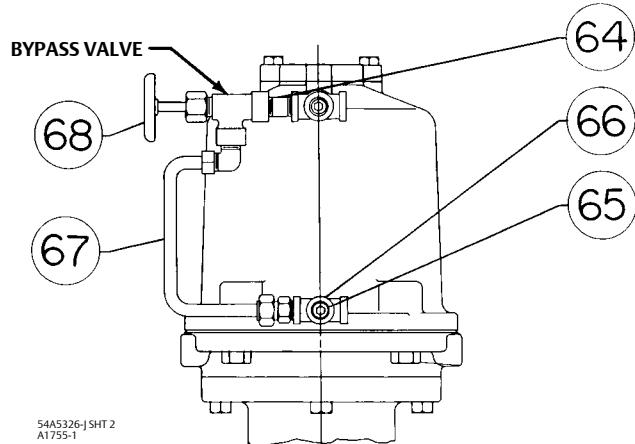
Figure 7. H Mounting for 44.5 or 50.8 mm (1-3/4 or 2-Inch) Keyed Equipment Shafts

Figure 8. Partial View of Actuator with Bypass Valve

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